

REMARKS

The subject invention relates to focusing optics for small spot metrology. Two embodiments are disclosed. The first embodiment is illustrated in Figure 4 and covers a system with a concave spherical mirror and a convex spherical mirror arranged in a mutually non-obscuring configuration. In addition, both mirrors are fabricated as off-axis sections and positioned in a substantially monocentric manner. The first embodiment provides for non-normal incidence illumination and/or collection of light.

The second embodiment, illustrated in Figure 6, is configured for normal incidence illumination and/or collection. The objective includes a concave off-axis paraboloid mirror and a flat mirror. Both the mirrors are positioned to be mutually non-obscuring.

In the Office Action, the Examiner rejected the claims based on the patents to Norton (6,778,273), Brierley (5,106,196) in view of the prior art of applicant's Figure 3 which illustrates a conventional Schwarzschild objective.

In response to the rejection, applicant has amended the claims related to the objective system illustrated in Figure 4 to be limited to the preferred embodiment thereof which requires that both mirrors be fabricated as off-axis sections and be positioned in a substantially monocentric manner.

The commonly owned patent to Norton teaches an illumination and light collection system which includes both concave and a convex elements. It should be noted that mirrors 10 and 13 of Norton are "mangin" mirrors. Mangin mirrors are actually catadioptric combinations which include a transmissive lens backed by a reflective surface. As such, Norton represents a substantially different focusing design than applicant's reflective objective. More importantly, Norton fails to disclose a system which includes mirrors that are fabricated as off-axis sections and positioned in a substantially monocentric manner.

To overcome this omission, the Examiner has relied on applicant's description of the Schwarzschild objective shown in Figure 3 and in particular its monocentric orientation. The Schwarzschild objective in Figure 3 is merely a classic example of a centrally obscured focusing system. Applicant's invention is intended **to avoid this central obscuration**. If Norton's focusing optics were modified in a manner as shown in applicant's Figure 3, the result would be monocentric but would also include a central obscuration. Applicant's Figure 4 embodiment demonstrates how one can achieve an all reflective objective system without a central

obscuration by using monocentric mirrors defined by off axis sections of two spherical mirrors. It is respectfully submitted that this combination of features would not be derived by one skilled in the art considering Norton and applicant's prior art discussion of Figure 3.

In the Office Action, the Examiner rejected claim 13 as being anticipated by Norton. In his rejection, the Examiner concluded that the preamble language of claim 13 relating to normal incidence reflectometry was not limiting. In response, applicant has amended claim 13 to specifically limit the claim to normal incidence illumination or collection. Since the Norton patent relates to off-axis illumination and collection and includes mangin mirrors that incorporate lenses, it cannot anticipate or render obvious amended claim 13 which requires all reflective focusing optical components oriented for operation at normal incidence.

In the Office Action, the Examiner rejected the claims relating to the embodiment illustrated in Figure 6 based on the patent to Brierley. The objective disclosed in Brierley, like Norton, is designed specifically for off-axis illumination and collection. A pair of concave parabolic mirrors 20, 22 are used to illuminate and collect the light at a relatively high angle of incidence. Brierley includes a flat mirror 36 for directing light to mirror 20 and a flat mirror 38 for capturing light collected by mirror 22. The Brierley patent fails to disclose a focusing system which provides either normal incidence illumination or collection of light. The Examiner's position is that it would have been obvious to use any desired angle of incidence since that chosen angle only depends on the orientation of the mirrors.

While it may be true that moving mirrors around can change the angle of incidence, it is not at all clear (absent applicant's teaching) that such a modification can be made to achieve a normal incidence orientation while still keeping the paraboloid and the flat mirror from obscuring each other. As shown in applicant's Figure 3, it is well known that reflective optics can be used to illuminate or collect light at normal incidence but at the expense of a central obscuration. Similarly, and as shown in applicant's Figure 2, it is well known that a transmissive objective lens can be used to produce normal incidence illumination and collection without obscuration. However, lenses have chromatic aberrations which can raise serious problems in broadband systems.

In contrast, applicant's Figure 6 embodiment illustrates an objective system which achieves normal incidence illumination or collection using mirrors rather than lenses and avoids the type of central obscuration that is associated with prior art normal incidence reflective

focusing systems. Contrary to the Examiner's position, absent applicant's teaching, one skilled in the art would not have been capable of modifying Brierley to achieve applicant's claimed invention. Moreover, it should be noted that Brierley's intent is to illuminate the sample at relatively high angles of incidence, so it is not at all clear that there would be any motivation to modify the Brierley device to create normal incidence illumination much less the suggestion of how that result might be achieved without creating an obscuration between the focusing elements. Accordingly, it is respectfully submitted that the patent to Brierley, whether taken alone or in combination with the Norton patent or applicant's Figure 3, fails to anticipate or render obvious applicant's invention as recited in independent claims 5, 6, 11, 12, and 13.

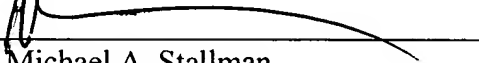
It is noted that applicant has added new claims 17 to 20 to cover the use of an aperture plate as shown in Figures 4 and 6 (410 and 610) and described in the subject specification. No new matter has been added.

In view of the above, it is respectfully submitted that the claims remaining in the application define patentable subject matter and allowance thereof is respectfully solicited.

Respectfully submitted,

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